

AMENDMENTS TO THE CLAIMS

LISTING OF CLAIMS

1-20 (cancelled)

21. (New) A portable power tool having an output spindle, an electric motor for driving the output spindle and a control system for controlling the operation of the motor including a power source and a power switching device interconnecting the power source to the motor for applying a constant frequency PWM drive signal from the power source to the motor, and a controller for controlling the power switching device and monitoring at least one operating characteristic of the power tool and reducing the frequency of said PWM drive signal in response to a predetermined change in said operating characteristic to thereby cause said power tool to enter a ratchet mode of operation.

22. (New) The power tool of claim 21 wherein said frequency of said PWM drive signal is reduced to a frequency less than 50 Hz.

23. (New) The power tool of claim 22 wherein said operating characteristic is motor current.

24. (New) The power tool of claim 23 wherein said predetermined change is an increase in motor current above a predetermined threshold.

25. (New) The power tool of claim 23 wherein said predetermined change corresponds to a rate of increase in motor current above a predetermined threshold.

26. (New) The power tool of claim 22 wherein said operating characteristic is the speed of the motor.

27. (New) The power tool of claim 26 wherein said predetermined change is a decrease in the speed of the motor below a predetermined threshold.

28. (New) The power tool of claim 26 wherein said predetermined change corresponds to a deceleration rate in the speed of the motor below a predetermined threshold.

29. (New) The power tool of claim 22 further including an operator actuable trigger switch and wherein said controller further controls the amount of power supplied to the motor by varying the duty cycle of the PWM drive signal in accordance with the actuated position of said trigger switch.

30. (New) The power tool of claim 21 wherein said power source is a battery.

31. (New) A control system for a portable power tool having an output spindle driven by an electric motor of the type that is responsive to the total power supplied to the motor via a drive signal for controlling the speed of the motor, said drive signal having associated therewith a frequency, the control system comprising:

a power switching device interconnecting the motor to a power source for applying said drive signal to said motor; and

a controller for monitoring an operating characteristic of the power tool and adjusting the frequency of the drive signal in accordance with a predetermined change in said operating characteristic to cause the motor to enter a ratchet mode of operation.

32. (New) The control system of claim 31 wherein said power source is a battery directly coupled to the power tool.

33. (New) The control system of claim 31 wherein said operating characteristic is motor current.

34. (New) The control system of claim 33 wherein said predetermined change is an increase in motor current above a predetermined threshold.

35. (New) The control system of claim 33 wherein said predetermined change corresponds to a rate of increase in motor current above a predetermined threshold.

36. (New) The control system of claim 31 wherein said operating characteristic is the speed of the motor.

37. (New) The control system of claim 36 wherein said predetermined change is a decrease in the speed of the motor below a predetermined threshold.

38. (New) The control system of claim 36 wherein said predetermined change corresponds to a deceleration rate in the speed of the motor below a predetermined threshold.

39. (New) The control system of claim 31 further including an operator actuatable trigger switch and wherein said controller further controls the amount of power supplied to the motor by controlling a characteristic of said drive signal in accordance with the actuated position of said trigger switch.

40. (New) The control system of claim 39 wherein said drive signal is a PWM signal and said characteristic of said drive signal is the duty cycle of the PWM signal.

41. (New) The control system of claim 40 wherein said controller reduces the frequency of said PWM drive signal from a relatively high value to a low value less than 50 Hz in response to a predetermined change in said operating characteristic.

42. (New) The control system of claim 41 wherein the frequency of said drive signal is sufficiently low to cause said power tool to enter into a ratchet mode of operation.

43. (New) The control system of claim 42 wherein said power source is a battery directly coupled to the power tool and said PWM drive signal is a d.c. signal.

44. (New) A power tool having an electric motor for driving an output spindle, a first operator actuable device for controlling the amount of power applied to the motor, and a control circuit for modulating the power supplied to the motor in accordance with the actuation of said first operator actuable device; the improvement comprising a second operator actuable device for selectively causing said control circuit to operate the motor in a pulse mode that produces substantial cyclical variations in the torque applied to said output spindle.

45. (New) The power tool of claim 44 wherein said first operator actuable device is a retractable trigger and the control circuit modulates the power supplied to the motor in accordance with the position of the trigger.

46. (New) The power tool of claim 45 wherein said second operator actuable device comprises a switch for selectively switching said control circuit between a first operating mode

wherein the modulated power supplied to the motor results in the smooth application of torque to the output spindle and a second pulse mode of operation wherein the power supplied to the motor is interrupted by OFF periods of sufficient duration to cause discrete incremental rotation of the output spindle.

47. (New) The power tool of claim 46 wherein said control circuit produces a PWM control signal that is supplied to the motor and further wherein the duty cycle of the PWM control cycle is varied in accordance with the position of the trigger.

48. (New) The power tool of claim 47 wherein said control circuit cycles the power to the motor in said second pulse mode of operation at a frequency of less than 50 Hz.

49. (New) The power tool of claim 47 wherein said switch selectively sets the frequency of said PWM control signal to a relatively high frequency in said first mode of operation and to a relatively low frequency less than 50 Hz in said second pulse mode of operation.

50. (New) A power tool having an electric motor for driving an output spindle, a first operator actuable device having a plurality of settings, and a control circuit connected to said first operator actuable device and to said electric motor, said control circuit controlling the amount of electrical power supplied to the motor by modulating an electrical signal in accordance with the setting of said first operator actuable device; the improvement comprising a second operator actuable device connected to said control circuit for selectively causing said control circuit to operate said motor in a pulse mode by cycling the power supplied to the motor ON and OFF with the intervening OFF periods being of sufficient duration to cause discrete incremental rotation of said output spindle.

51. (New) The power tool of claim 50 wherein said first operator actuable device is a retractable trigger and the control circuit modulates the power supplied to the motor in accordance with the position of the trigger.

52. (New) The power tool of claim 51 wherein said second operator actuable device comprises a switch for selectively switching said control circuit between a first operating mode wherein the modulated power supplied to the motor results in the smooth application of torque to the output spindle and a second operating mode corresponding to said pulse mode.